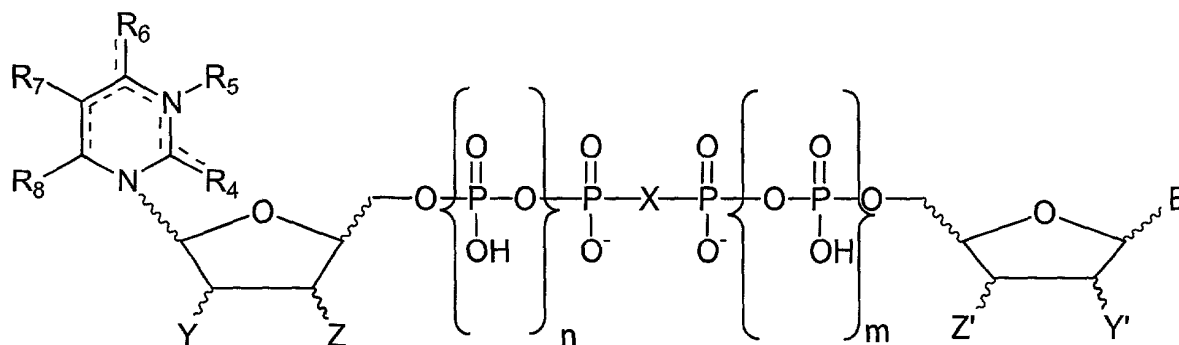


**WHAT IS CLAIMED IS:**

1. A compound of Formula IIIA:

**Formula IIIA**



wherein:

X is oxygen, methylene, difluoromethylene, imido;

n = 0, 1, or 2;

m = 0, 1, or 2;

n + m = 0, 1, 2, 3, or 4;

B is a purine or a pyrimidine residue linked through the 9- or 1-position, respectively;

Z = OH or N<sub>3</sub>;

Z' = OH or N<sub>3</sub>;

Y = H or OH;

Y' = H or OH;

provided that when Z is N<sub>3</sub>, Y is H or when Z' is N<sub>3</sub>, Y' is H;

R<sub>4</sub> is oxo, amino, cyano, aralkoxy, C<sub>1-6</sub> alkoxy, C<sub>1-6</sub> alkylamino, or dialkylamino;

R<sub>5</sub> is hydrogen, acyl or benzoyl, C<sub>1-6</sub> alkyl, phenyloxy, C<sub>1-5</sub> alkanoyl or

absent;

R<sub>6</sub> is oxo, hydroxy, mercapto, C<sub>1-4</sub>alkoxy, C<sub>7-12</sub>arylalkoxy, C<sub>1-6</sub>alkylthio, amino, C<sub>1-5</sub> disubstituted amino, triazolyl, C<sub>1-6</sub>alkylamino or di-C<sub>1-4</sub>alkylamino, where the alkyl groups is optionally linked to form a heterocycle or link to N<sup>3</sup> to form a substituted ring; or

R<sub>5</sub> and R<sub>6</sub> taken together form a 5-membered fused imidazole ring between positions 3 and 4 of the pyrimidine ring, which is optionally substituted on the 4- or 5- positions of the etheno moiety with C<sub>1-4</sub>alkyl, phenyl, or phenyloxy, which themselves are optionally substituted;

5 R<sub>7</sub> is hydrogen, hydroxy, cyano, nitro, C<sub>2-8</sub>alkenyl, C<sub>1-4</sub>alkyl, phenyl, substituted C<sub>2-8</sub>alkynyl, halogen, C<sub>1-4</sub>alkyl, substituted C<sub>1-4</sub>alkyl, CF<sub>3</sub>, C<sub>2-6</sub> alkyl, C<sub>2-3</sub> alkenyl, allylamino, bromvinyl, ethyl propenoate, propenoic acid, C<sub>2-3</sub> alkynyl, substituted C<sub>2-3</sub>alkynyl; or

10 R<sub>6</sub> and R<sub>7</sub> taken together form a 5 or 6-membered saturated or unsaturated ring bonded through N or O at R<sub>6</sub>, such ring optionally contain substituents that themselves contain functionalities;

15 R<sub>8</sub> is hydrogen, amino or di-C<sub>1-4</sub>alkylamino, C<sub>1-4</sub>alkoxy, C<sub>7-12</sub>arylalkoxy, C<sub>1-4</sub>alkylthio, C<sub>7-12</sub>arylalkylthio, carboxamidomethyl, carboxymethyl, methoxy, methylthio, phenoxy or phenylthio; provided that when R<sub>8</sub> is amino or substituted amino, R<sub>7</sub> is hydrogen;

provided that when B = adenine, adenine 1-oxide, or 1,N<sup>6</sup>-ethenoadenine, then:

(a) R<sub>6</sub> ≠ oxo when R<sub>4</sub> = oxo, Y = Z = OH and R<sub>5</sub> = R<sub>7</sub> = R<sub>8</sub> = H;

(b) R<sub>7</sub> ≠ Br when R<sub>4</sub> = R<sub>6</sub> = oxo, Y = Z = OH, and R<sub>5</sub> = R<sub>8</sub> = H;

20 provided that when B = adenine, then:

(a) R<sub>6</sub> ≠ amino when R<sub>4</sub> = oxo, Y = Z = OH, R<sub>5</sub> is absent, R<sub>7</sub> = R<sub>8</sub> = H, and n + m = 0, 1, or 2;

(b) R<sub>7</sub> ≠ CH<sub>3</sub> when R<sub>4</sub> = R<sub>6</sub> = oxo, Y = H, Z = OH, and R<sub>5</sub> = R<sub>8</sub> = H;

(c) R<sub>7</sub> ≠ F when R<sub>4</sub> = R<sub>6</sub> = oxo, Y = H, Z = OH, R<sub>5</sub> = R<sub>8</sub> = H and n + m = 2;

25 provided that when B = thymine, Y' = H and Z' = N<sub>3</sub>; then R<sub>7</sub> ≠ F, when R<sub>4</sub> = R<sub>6</sub> = oxo, Y = OH, Z = OH, R<sub>5</sub> = R<sub>8</sub> = H, and n + m = 0;

provided that when B = thymine, Y' = H and Z' = N<sub>3</sub>; then R<sub>7</sub> ≠ CH<sub>3</sub> when R<sub>4</sub> = R<sub>6</sub> = oxo, Y = H, Z = N<sub>3</sub>, R<sub>5</sub> = R<sub>8</sub> = H, and n + m = 0;

30 provided that when B = guanine, then:

(a) R<sub>6</sub> ≠ oxo when R<sub>4</sub> = oxo, Y = Z = OH, R<sub>5</sub> = R<sub>7</sub> = R<sub>8</sub> = H and n + m = 1 or 2;

- (b)  $R_6 \neq \text{amino}$  when  $R_4 = \text{oxo}$ ,  $Y = Z = \text{OH}$ ,  $R_5$  is absent,  $R_7 = R_8 = \text{H}$ ,  $n+m=1$  or 2;

provided that when B is uridine, or 5-Br-uridine, then

- 5 (a)  $R_6 \neq \text{oxo}$  when  $R_4 = \text{oxo}$ ,  $Y = Z = \text{OH}$  and  $R_6 = R_7 = R_8 = \text{H}$ ;  
 (b)  $R_7 \neq \text{Br}$  when  $R_4 = R_6 = \text{oxo}$ ,  $Y = Z = \text{OH}$ , and  $R_5 = R_8 = \text{H}$ ;

provided that when B is 5-FU, then  $R_7 \neq \text{F}$ , when  $R_4 = R_6 = \text{oxo}$ ,  $Y = \text{H}$ ,  $Z = \text{OH}$ ,  $R_5 = R_8 = \text{H}$ , and  $n + m = 0$ ;

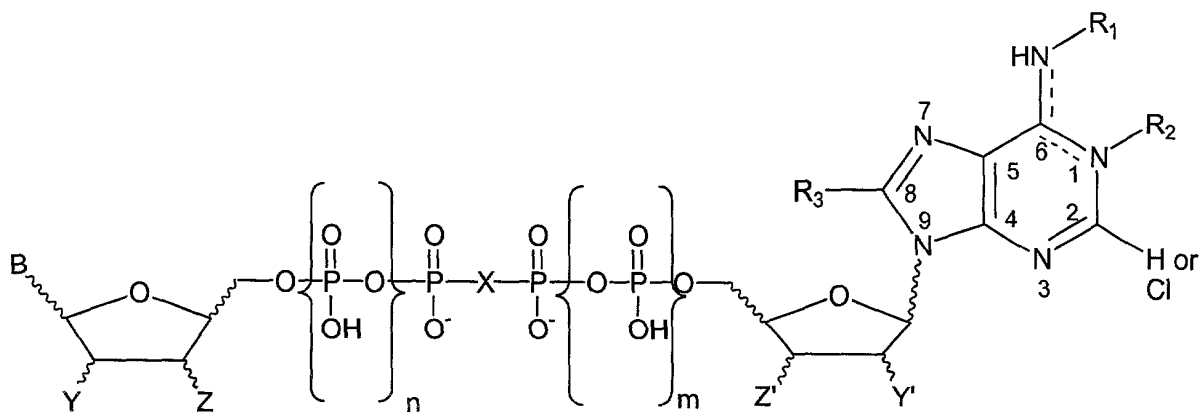
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provided that when B is cytosine, then  $R_6 \neq \text{amino}$ , when  $R_4 = \text{oxo}$ ,  $Y = Z = \text{OH}$ ,  $R_5$  is absent,  $R_7 = R_8 = \text{H}$ , and  $n + m = 1$ , or 2; and

provided that when B is cytosine, then  $R_6 \neq \text{oxo}$ , when  $R_4 = \text{oxo}$ ,  $Y = Z = \text{OH}$  and  $R_6 = R_7 = R_8 = \text{H}$ , and  $n + m = 2$ .

15

2. A compound according to Formula IIA:



Formula IIA

20

wherein:

X is oxygen, methylene, difluoromethylene, imido;

n = 0, 1, or 2;

m = 0, 1, or 2;

n + m = 0, 1, 2, 3, or 4;

B is a purine residue linked through the 9- position;

Z = OH or N<sub>3</sub>;

Z' = OH or N<sub>3</sub>;

Y = H or OH;

Y' = H or OH;

provided that when Z is N<sub>3</sub>, Y is H or when Z' is N<sub>3</sub>, Y' is H;

R<sub>1</sub> is H, C<sub>1-8</sub>alkyl, phenyl or phenyloxy, optionally substituted with halogen, hydroxy, C<sub>1-4</sub>alkoxy, C<sub>1-4</sub>alkyl, C<sub>6-10</sub>aryl, carboxy, cyano, nitro, sulfonamido, sulfonate, phosphate, sulfonic acid, amino or substituted amino, wherein the amino is singly or doubly substituted by a C<sub>1-4</sub> alkyl and when doubly substituted, the alkyl groups are optionally linked to form a heterocycle; or A(C<sub>1-6</sub>alkyl)CONH(C<sub>1-6</sub>alkyl)B wherein A and B are amino, mercapto, hydroxy or carboxyl;

R<sub>2</sub> is O or is absent; or

R<sub>1</sub> and R<sub>2</sub> taken together forms a 5-membered fused imidazole ring, which is optionally substituted on the 4- or 5- positions of the etheno moiety with C<sub>1-4</sub>alkyl, phenyl or phenyloxy, optionally substituted with halogen, hydroxy, C<sub>1-4</sub>alkoxy, C<sub>1-4</sub>alkyl, C<sub>6-10</sub>aryl, arylalkyl, carboxy, cyano, nitro, sulfonamido, sulfonate, phosphate, sulfonic acid, amino or substituted amino, wherein the amino is singly or doubly substituted by a C<sub>1-4</sub> alkyl and when doubly substituted, the alkyl groups is optionally linked to form a heterocycle; and

R<sub>3</sub> is H, C<sub>1-8</sub>alkyl, phenyl or phenyloxy, optionally substituted with halogen, hydroxy, C<sub>1-4</sub>alkoxy, C<sub>1-4</sub>alkyl, C<sub>6-10</sub>aryl, carboxy, cyano, nitro, sulfonamido, sulfonate, phosphate, sulfonic acid, amino or substituted amino, wherein the amino is singly or doubly substituted by a C<sub>1-4</sub> alkyl and when doubly substituted, the alkyl groups is optionally linked to form a heterocycle; C<sub>7-12</sub>arylalkyl; C<sub>1-4</sub>alkylamino, phenylamino, C<sub>7-12</sub>arylalkylamino, C<sub>1-4</sub>alkoxy, or C<sub>7-12</sub>arylalkyloxy; C<sub>1-4</sub>alkylthio, phenylthio, C<sub>7-12</sub>arylalkylthio, or -A(C<sub>1-6</sub>alkyl)CONH(C<sub>1-6</sub>alkyl)B- wherein A and B are independently

amino, mercapto, hydroxy or carboxyl;

provided that  $R_1 \neq H$ , when X is oxygen, methylene, or difluoromethylene, Y is OH, B is adenine,  $R_2$  is absent, and  $R_3$  is hydrogen;

provided that  $R_1 \neq H$ , when  $n + m = 2$ , X is oxygen, Y is OH, B is adenine,  $R_2$  is absent, and  $R_3$  is bromo, or 6-aminohexyl;

provided that  $R_1 \neq H$ , when  $n + m = 2$ , X is oxygen, Y is H, B is adenine,  $R_2$  is absent, and  $R_3$  is H;

provided that  $R_2 \neq O$ , when  $n + m = 2$ , X is oxygen, Y is OH,  $R_1 = R_3 = H$ , and B is adenine, adenine 1-oxide, or 1,N<sup>6</sup>-ethenoadenine;

provided that  $R_1$  and  $R_2$  do not form a 5-membered fused imidazole ring, when  $n + m = 2$ , X is oxygen, Y is OH,  $R_3$  is H, and B is adenine, adenine 1-oxide, or ethenoadenine.

3. The compound according to Claim 1 or 2, wherein the ribosyl moieties are in the D- configuration.

4. The compound according to Claim 1 or 2, wherein the ribosyl moieties are in the L- configuration.

5. A pharmaceutical composition comprising a compound of Formula IA or IB as described in Claim 1 or 2, or a pharmaceutically acceptable salt thereof together with a pharmaceutically acceptable carrier therefor.

6. A method of treating chronic obstructive pulmonary diseases in a mammal by administering an effective chronic obstructive pulmonary disease treatment amount of a compound of Formula IA or IB as described in Claim 1 or 2.

7. A method of treating sinusitis, otitis media or nasolacrimal duct obstruction in a mammal by administering an effective mucus secretion clearing amount of a compound of Formula IA or IB as described in Claim 1 or 2.

8. A method of treating dry eye in a mammal by administering an effective dry eye treatment amount of a compound of Formula IA or IB as described in Claim 1 or 2.

5 9. A method of treating retinal detachment in a mammal by administering an effective retinal detachment treatment amount of a compound of Formula I as described in Claim 1 or 2.

10 10. A method of facilitating sputum induction in a mammal by administering an amount of a compound of Formula IA or IB as described in Claim 1 or 2, effective to facilitate sputum induction.

11. A method of facilitating expectoration in a mammal by administering an amount of a compound of Formula IA or IB as described in Claim 1 or 2, effective to facilitating expectoration.